Smart Agriculture & Smart Machinery

Precision Engineering Program

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University of Florida





Precision Ag Engineering Program



From Left to Right: **Daniel Escobedo** *Summer Intern*, **Jorge Escobedo** *Summer Intern*, **Dr. Jaafar Abdulridha** *Post Doctoral Associate*, **Dr. Yiannis Ampatzidis** *Program Leader*, **Dr. Xiuhua Zhang** *Visiting Scholar from China*, **Dr. Thanos Balafoutis** *Visiting Scholar from Greece*, **Magda Derival** *Research Assistant*, **Shirin Ghatresamani** *PhD Student*, **Sri Charan Kakarla** *Engineer* Not Pictured: **Victor Partel** *Research Assistant*

https://twitter.com/PrecAgSWFREC

SmartAg. Vision

Digital Farming / Big Data / Internet of Things (IoT)

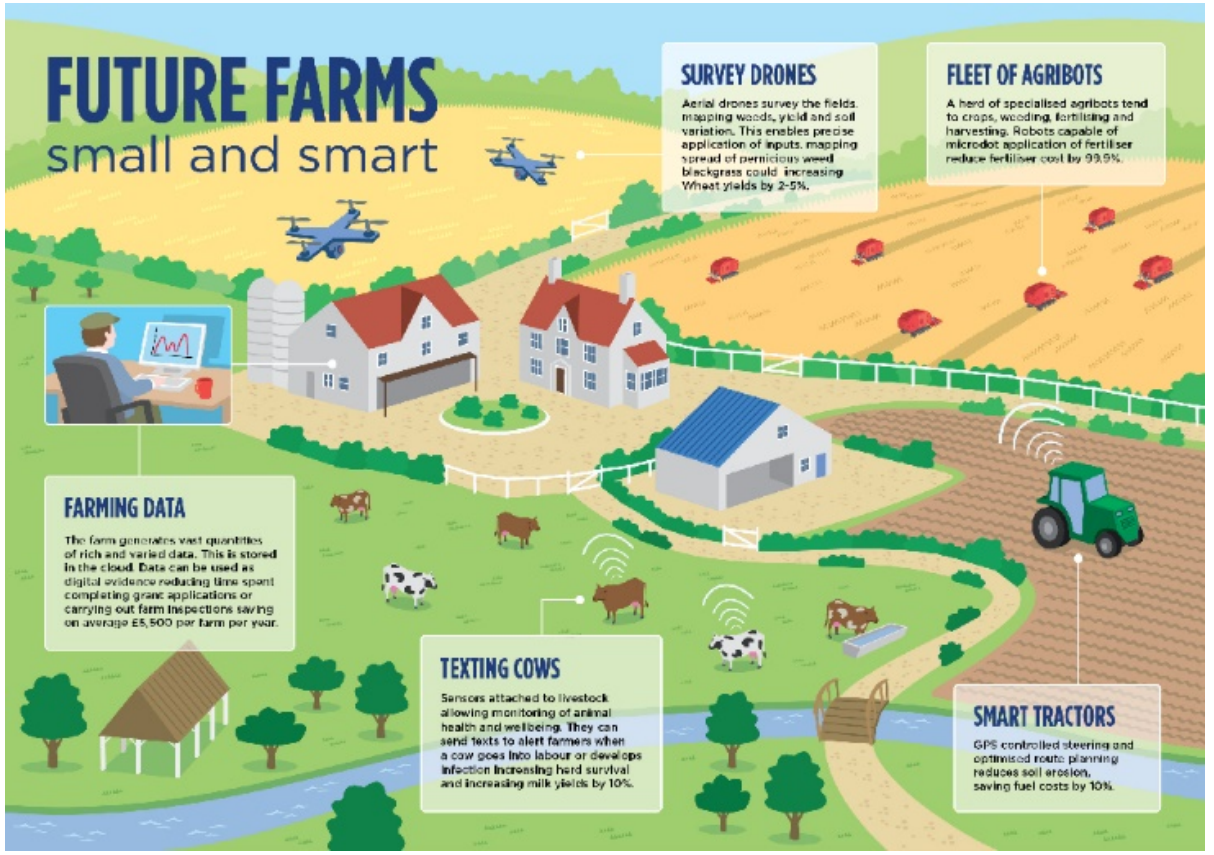
Smart Farming / Smart-Intelligence Machinery

Robotics / Artificial Intelligence (AI) /Automation

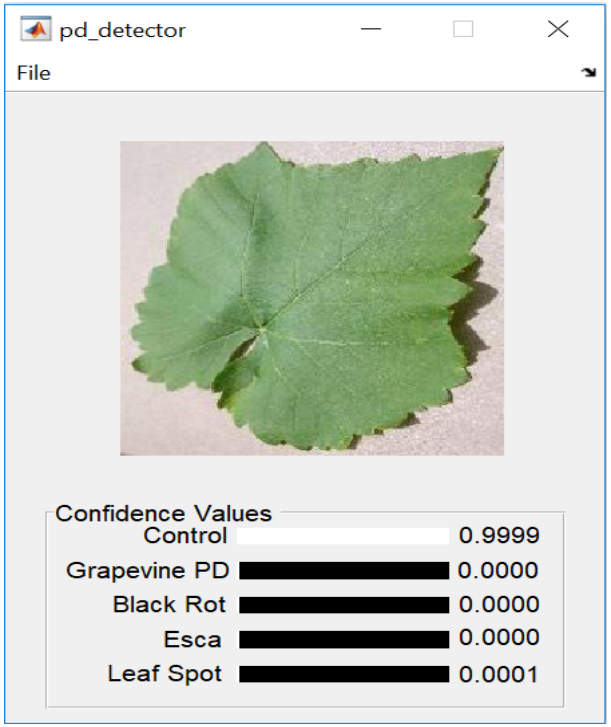
Digital Farming, Artificial Intelligence and Machine Learning In Agriculture

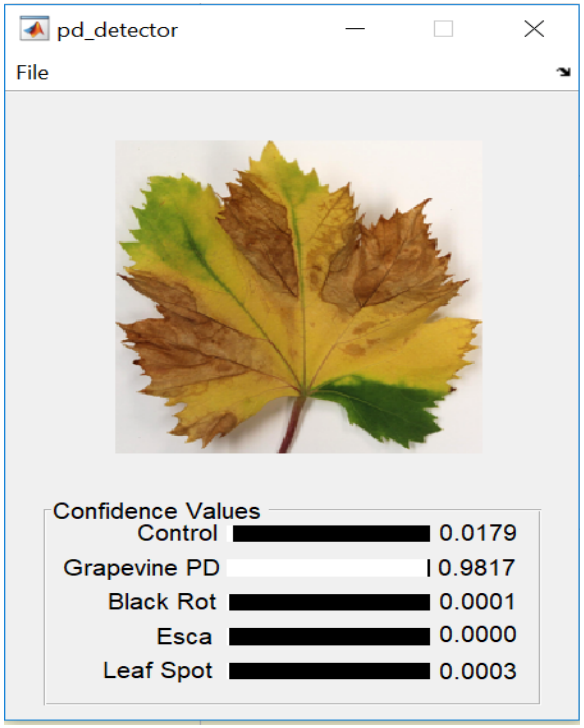


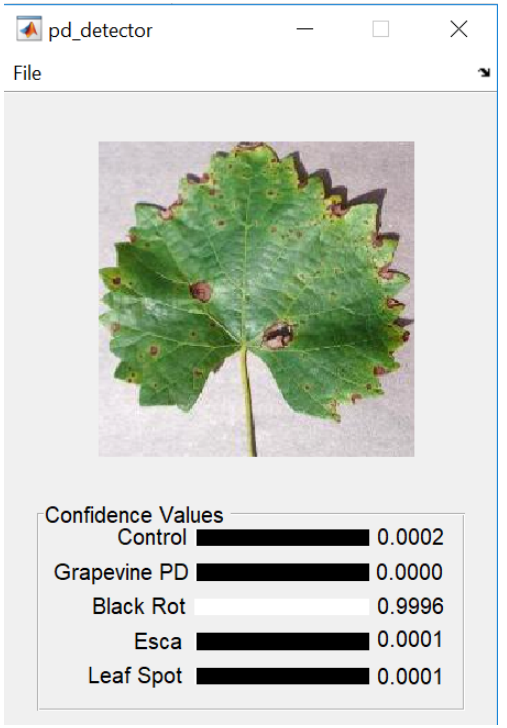




Digital Pierce's Disease Diagnosis Using Vision-Based Detection System

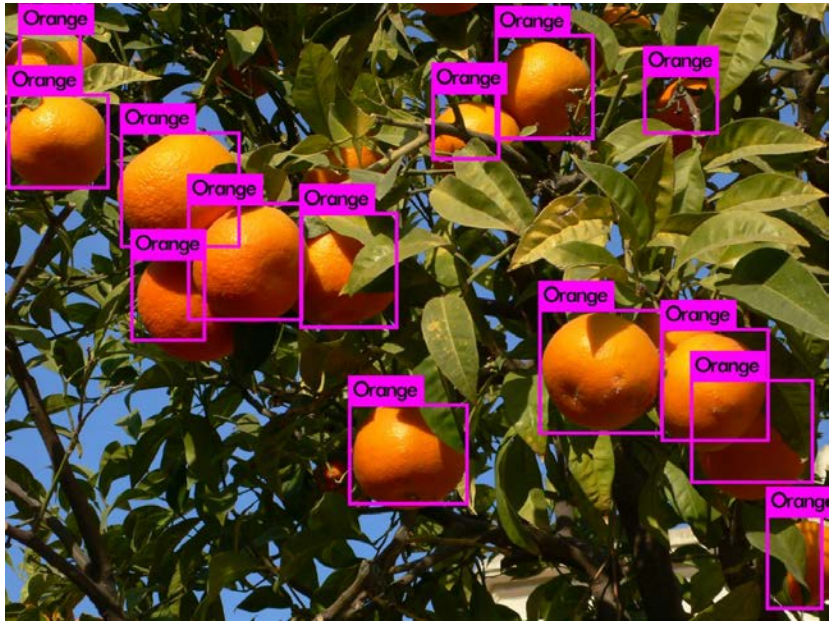


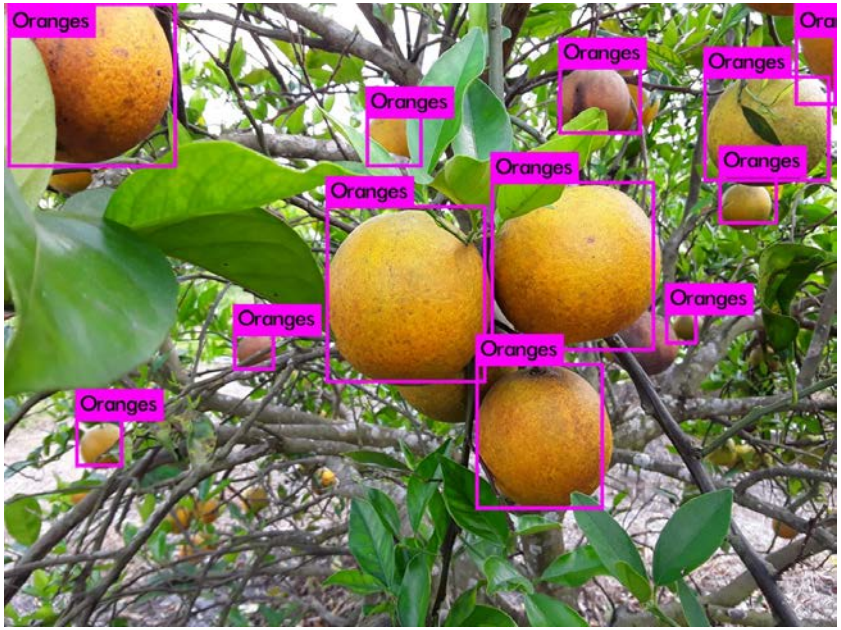


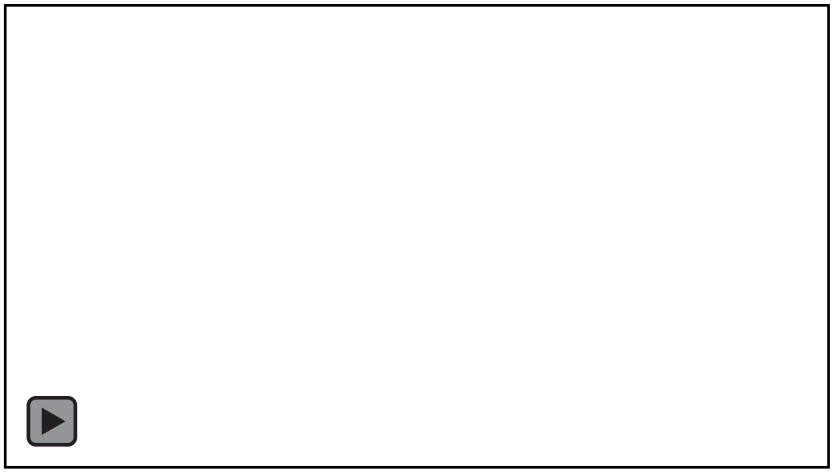


Cruz A., **Ampatzidis Y.**, Pierro R., Materazzi A., Panattoni A., De Bellis L., Luvisi A., 2018. Detection of Grapevine Yellows Symptoms in Vitis vinifera L. with Artificial Intelligence. Computers and Electronics in Agriculture (accepted).

Real-Time Citrus detection using Artificial Intelligence-AI on an @NVidia Jetson TX2 board.

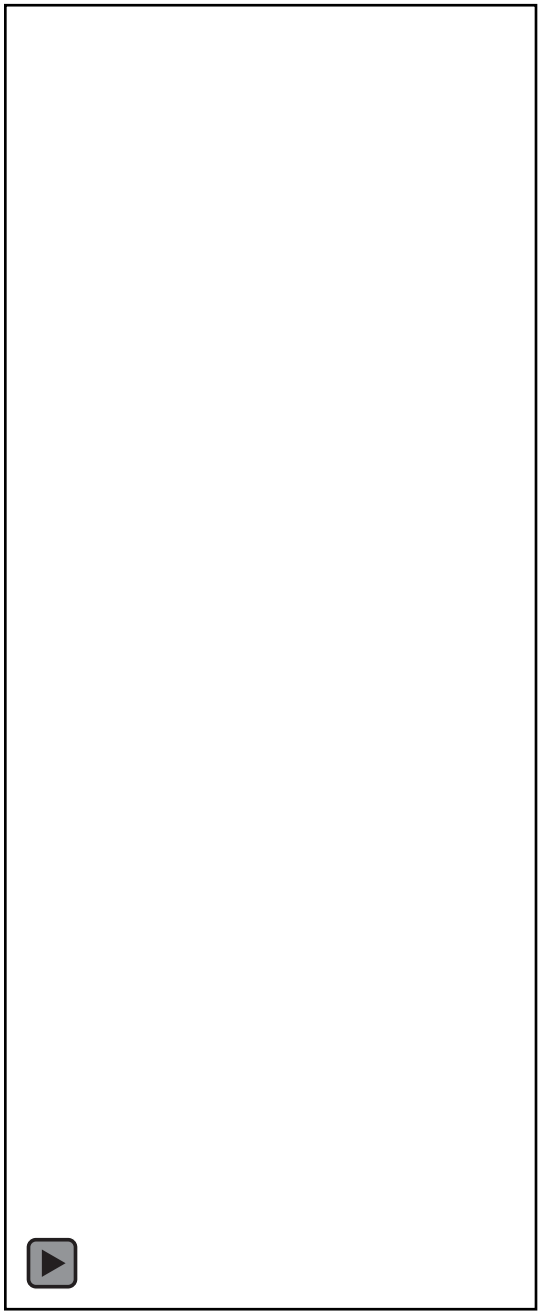








https://twitter.com/i/status/1042058065481269248



https://twitter.com/i/status/1042058065481269248

Mechanization of Strawberry Harvesting for Long Term Sustainability







Artificial Intelligence for Precision Pest Management in Vegetables and Strawberry

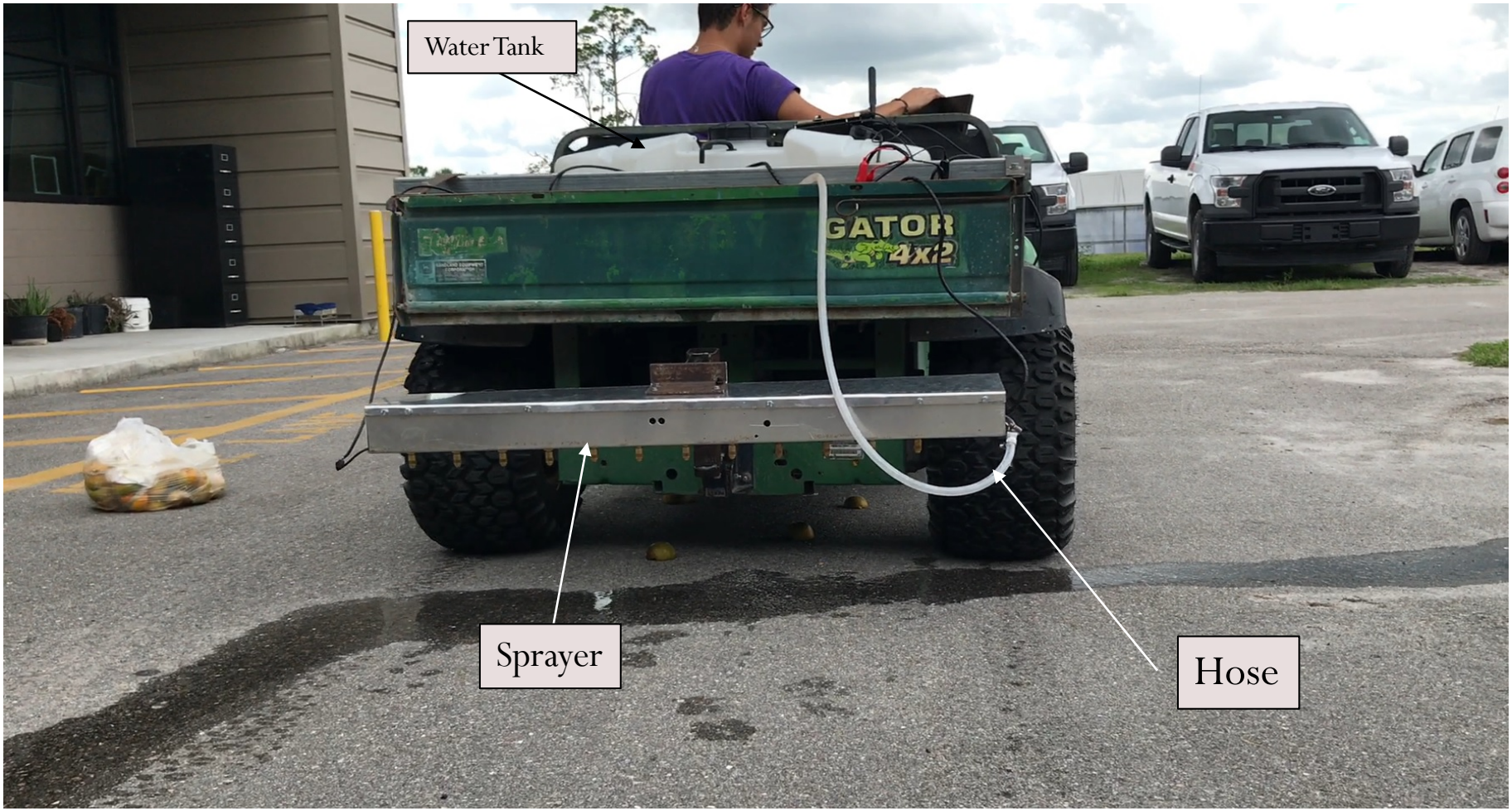
Precision Weeding

Blue River Technology



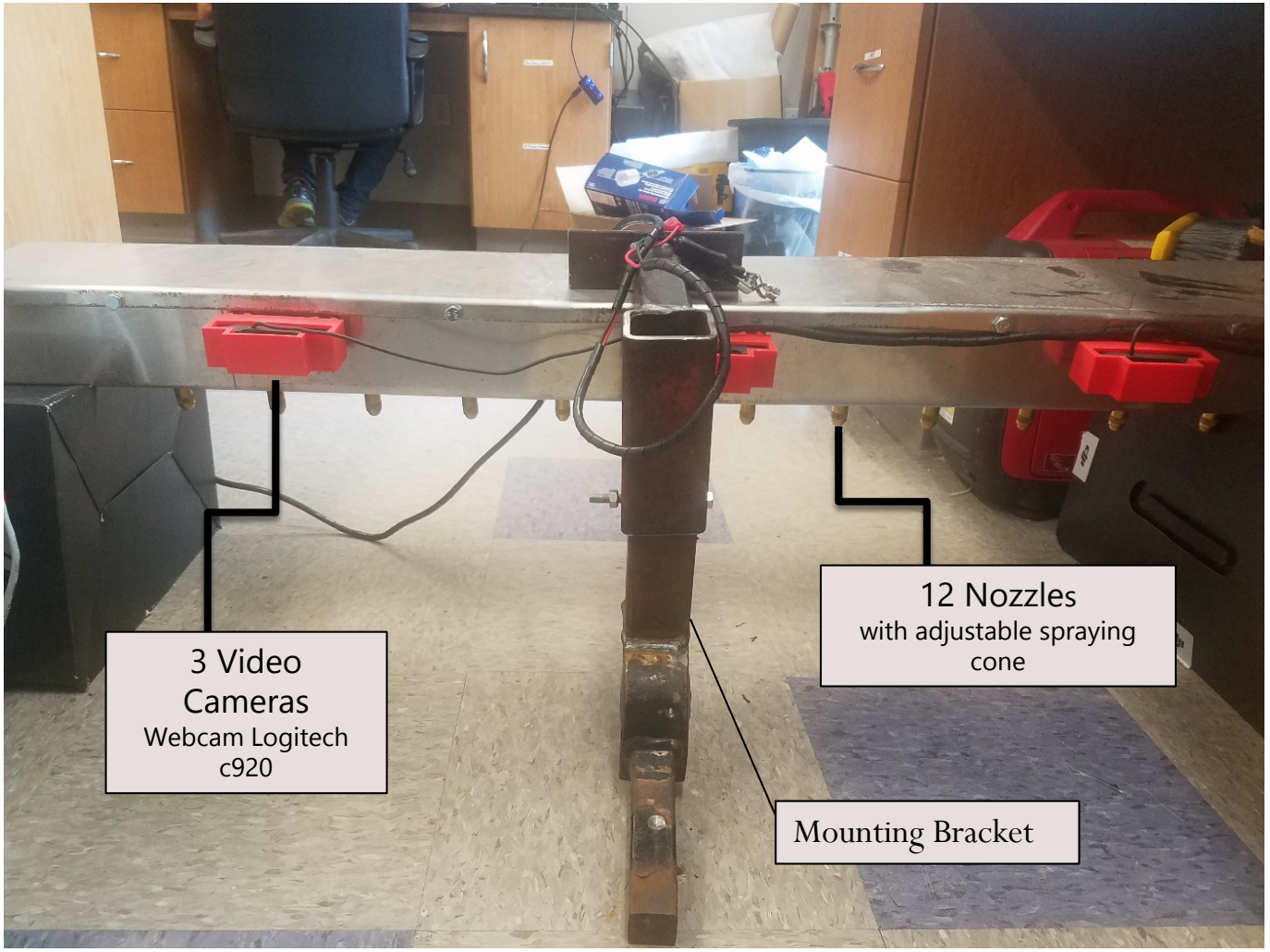
- 5,000 plants per minute
- 40 acres/day by one machine
- ¼ precision in inches at 4 mph

Precision Sprayer (PS) for Weed Management

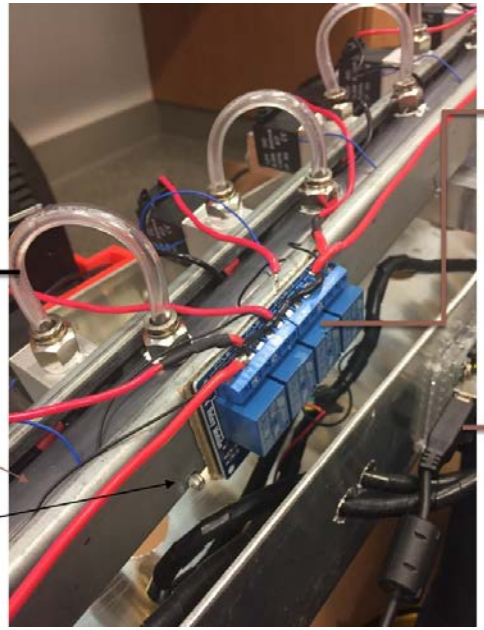


Partel V., Kakarla S.C., and Ampatzidis Y, 2018. **Development and Evaluation of a Low-Cost and Smart Technology for Precision Weed Management Utilizing Artificial Intelligence**. Computers and Electronics in Agriculture (under review).

PS Main Components



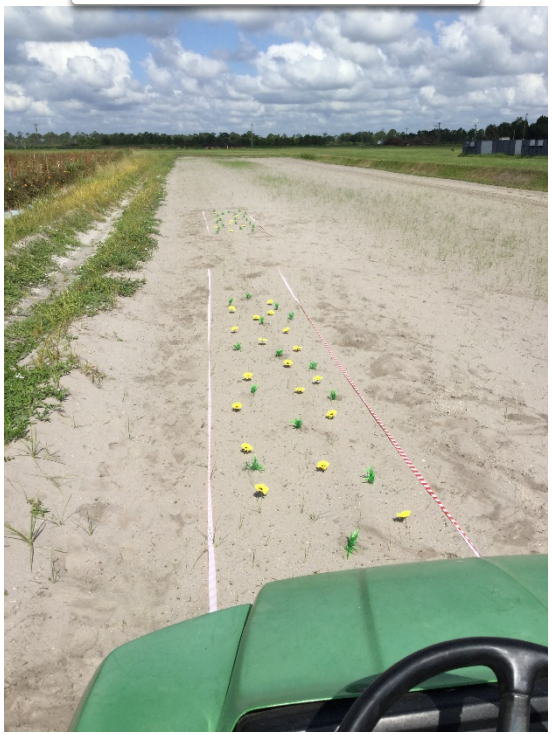
PS Main Components







Before



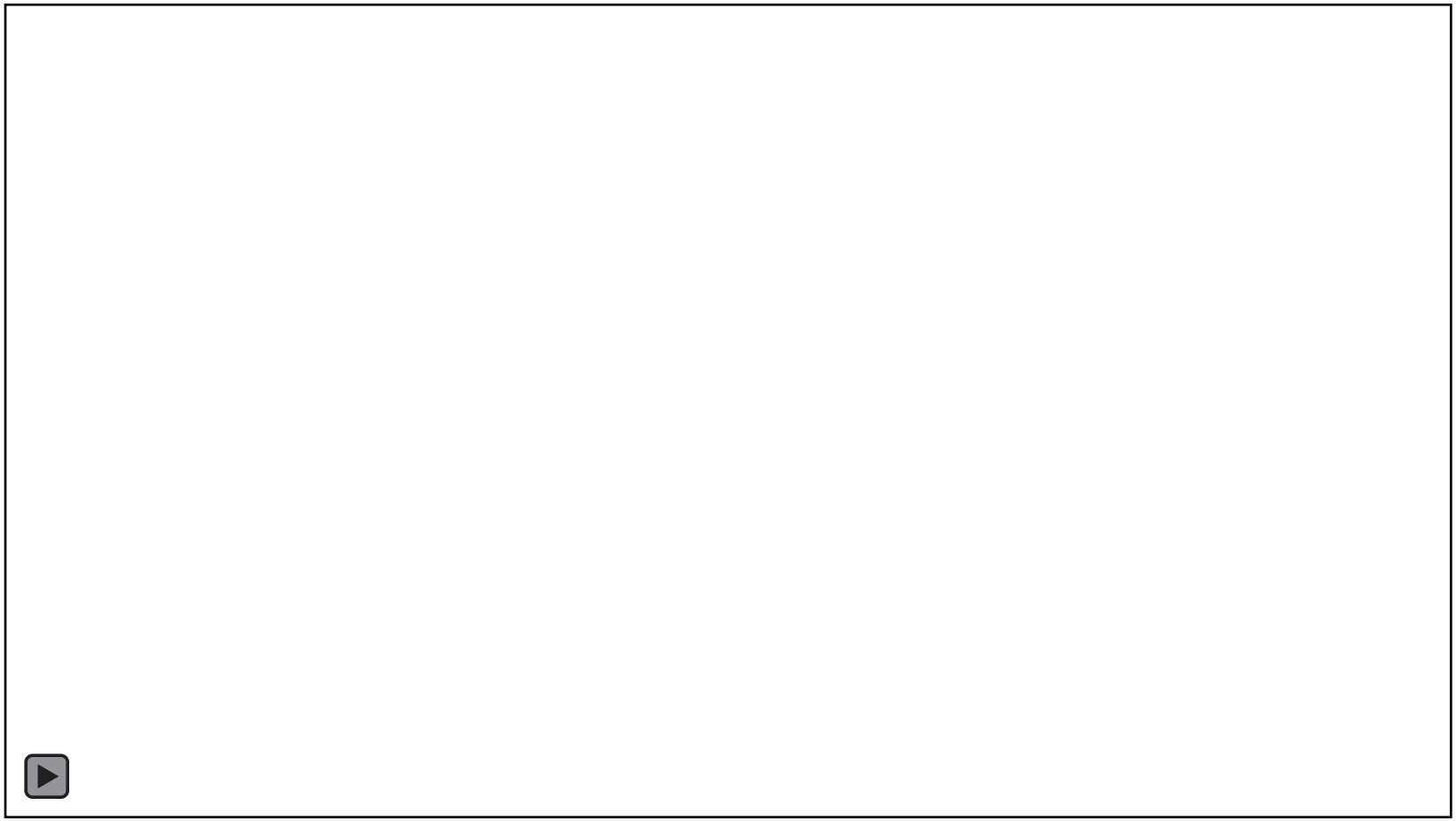


After



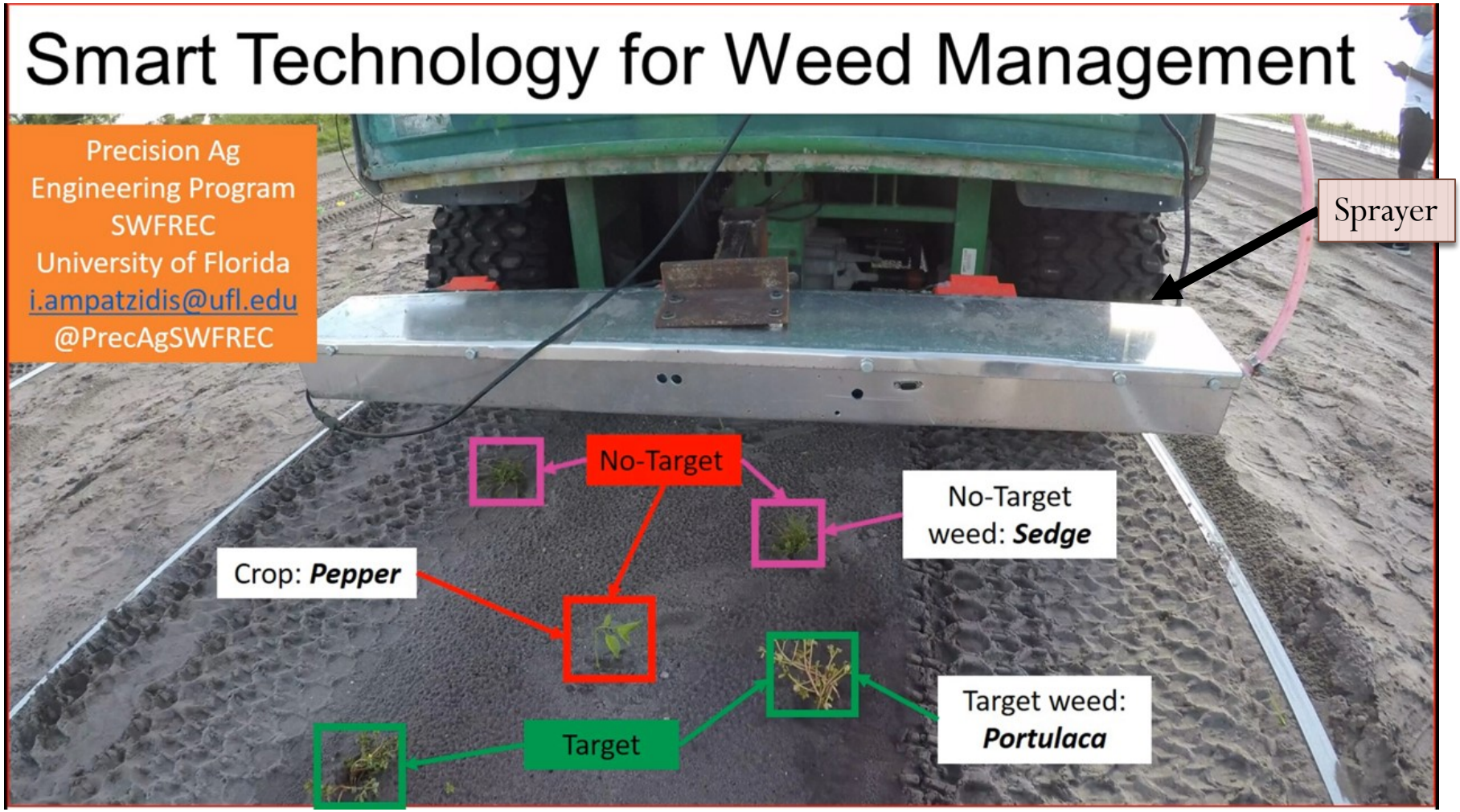


Precision Sprayer (PS) for Weed Management Demo/Video



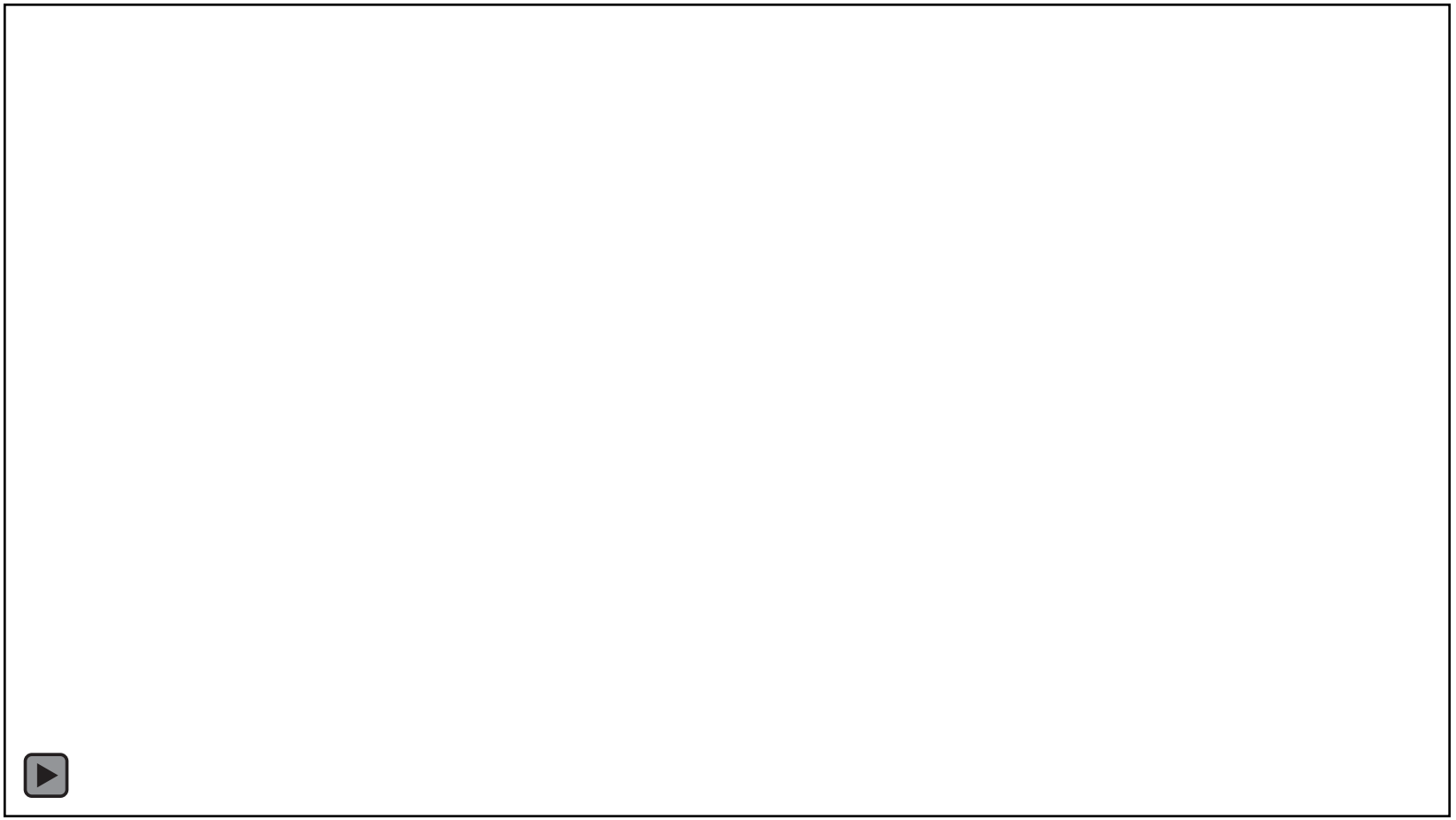
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Precision Sprayer (PS) for Weed Management



https://twitter.com/i/status/1045013127593644032

Precision Sprayer (PS) for Weed Management Demo/Video

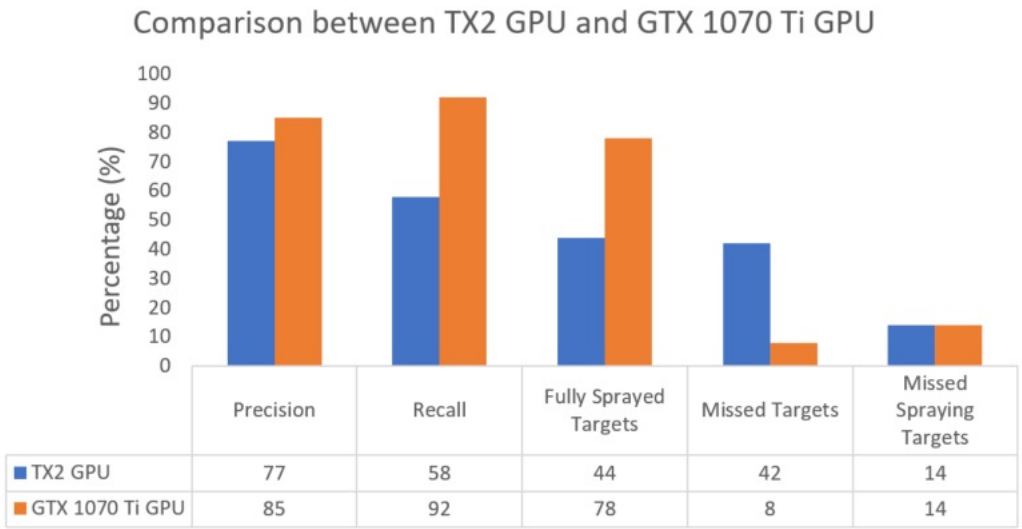


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Precision Sprayer (PS) for Weed Management

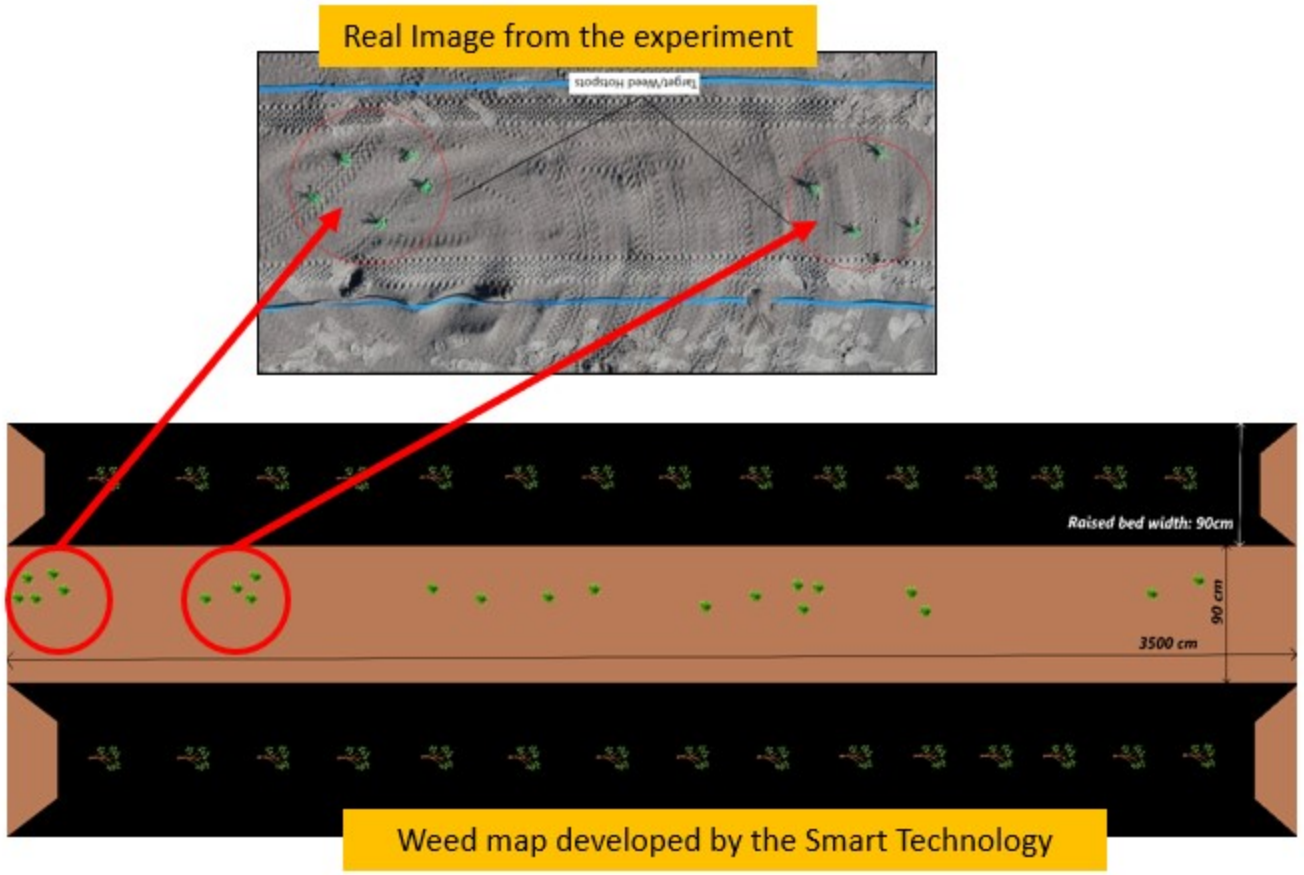
Table 5. Results for the experiment 4, with real plants, using the GTX 1070 Ti GPU.

Reps	Case A	Case B	Case C	Case D	Case E	Precision	Recall	Fully Sprayed Target	Half-Sprayed Target	Missed Spraying Target	Missed Target
Rep 1	18	0	2	0	4	83%	100%	90%	0%	10%	0%
Rep 2	14	0	3	3	6	74%	85%	70%	0%	15%	15%
Rep 3	20	0	0	0	2	91%	100%	100%	0%	0%	0%
Rep 4	14	0	4	2	3	86%	90%	70%	0%	20%	10%
Rep 5	19	0	1	0	4	83%	100%	95%	0%	5%	0%
Rep 6	14	0	4	2	3	86%	90%	70%	0%	20%	10%
Rep 7	18	0	2	0	1	95%	100%	90%	0%	10%	0%
Rep 8	11	0	6	3	4	81%	85%	55%	0%	30%	15%
Rep 9	14	0	3	3	3	85%	85%	70%	0%	15%	15%
Rep 10	13	0	4	3	3	85%	85%	65%	0%	20%	15%
					Average	**85%**	**92%**	**78%**	**0%**	**14%**	**8%**



Partel V., Kakarla S.C., and Ampatzidis Y, 2018. **Development and Evaluation of a Low-Cost and Smart Technology for Precision Weed Management Utilizing Artificial Intelligence**. Computers and Electronics in Agriculture (under review).

Precision Sprayer (PS) for Weed Management



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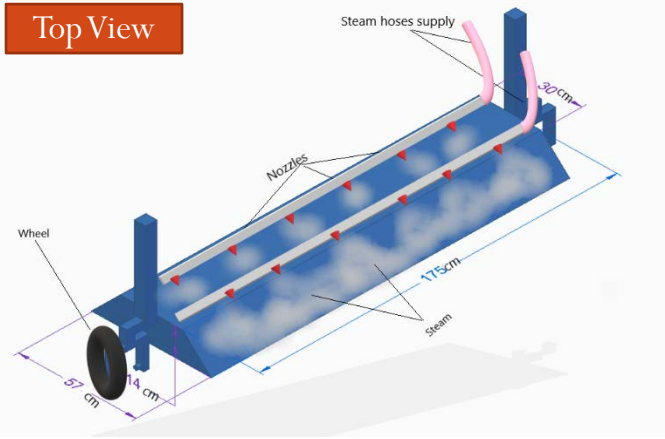
Steam Sprayer for Weed Management

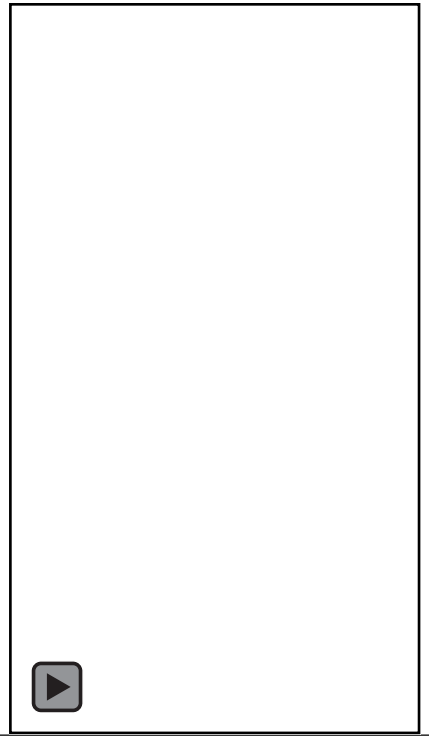




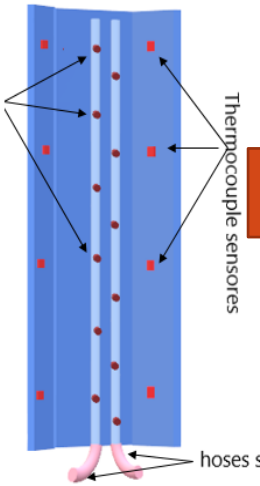


Top View





Nozzles

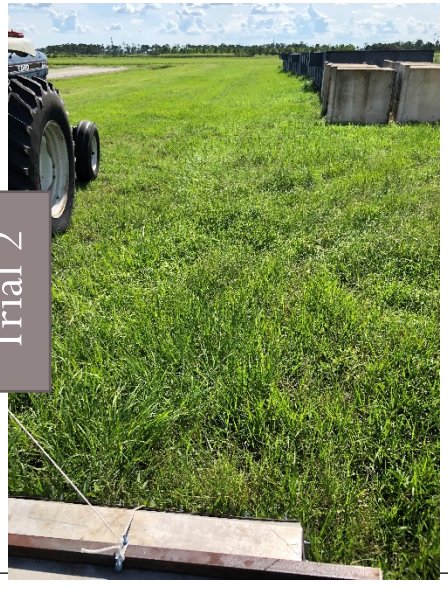


Bottom View

Steam Sprayer for Weed Management

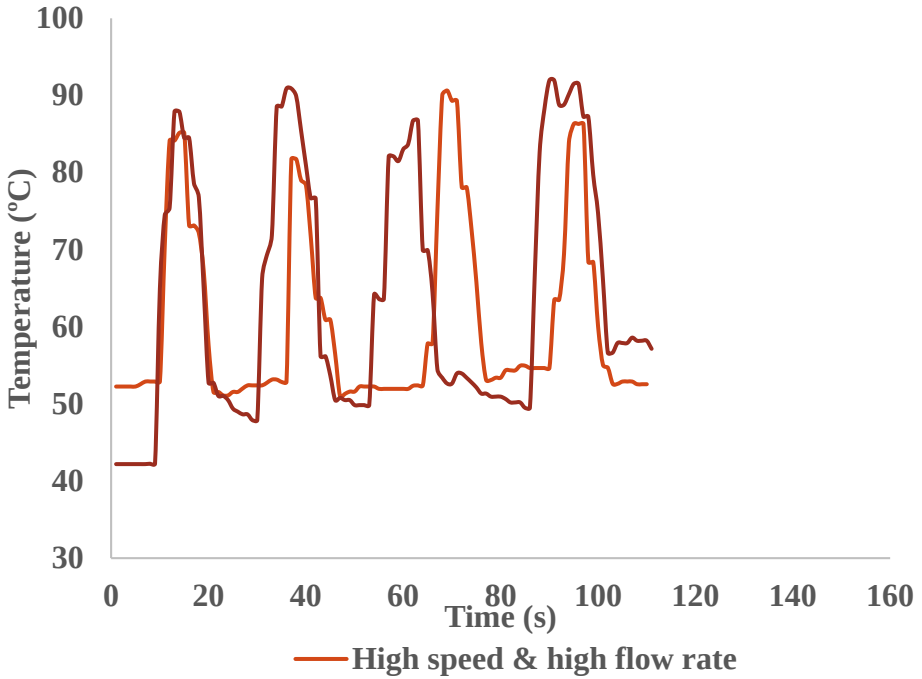
	Before	After 10 min	After 1 h	After 3 h
Trial 1				
Trial 2				

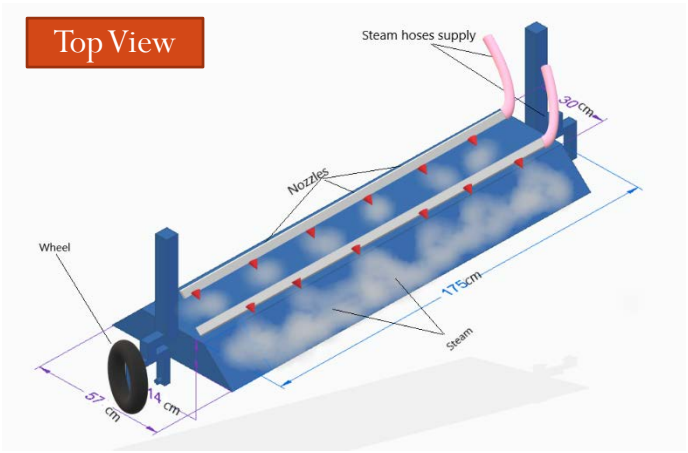
Steam Sprayer for Weed Management

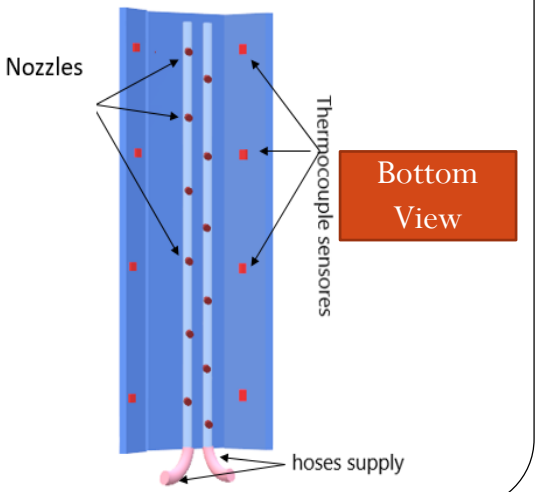
	Before	After 10 min	After 5 h
Trial 1			
Trial 2			

Steam Sprayer for Weed Management

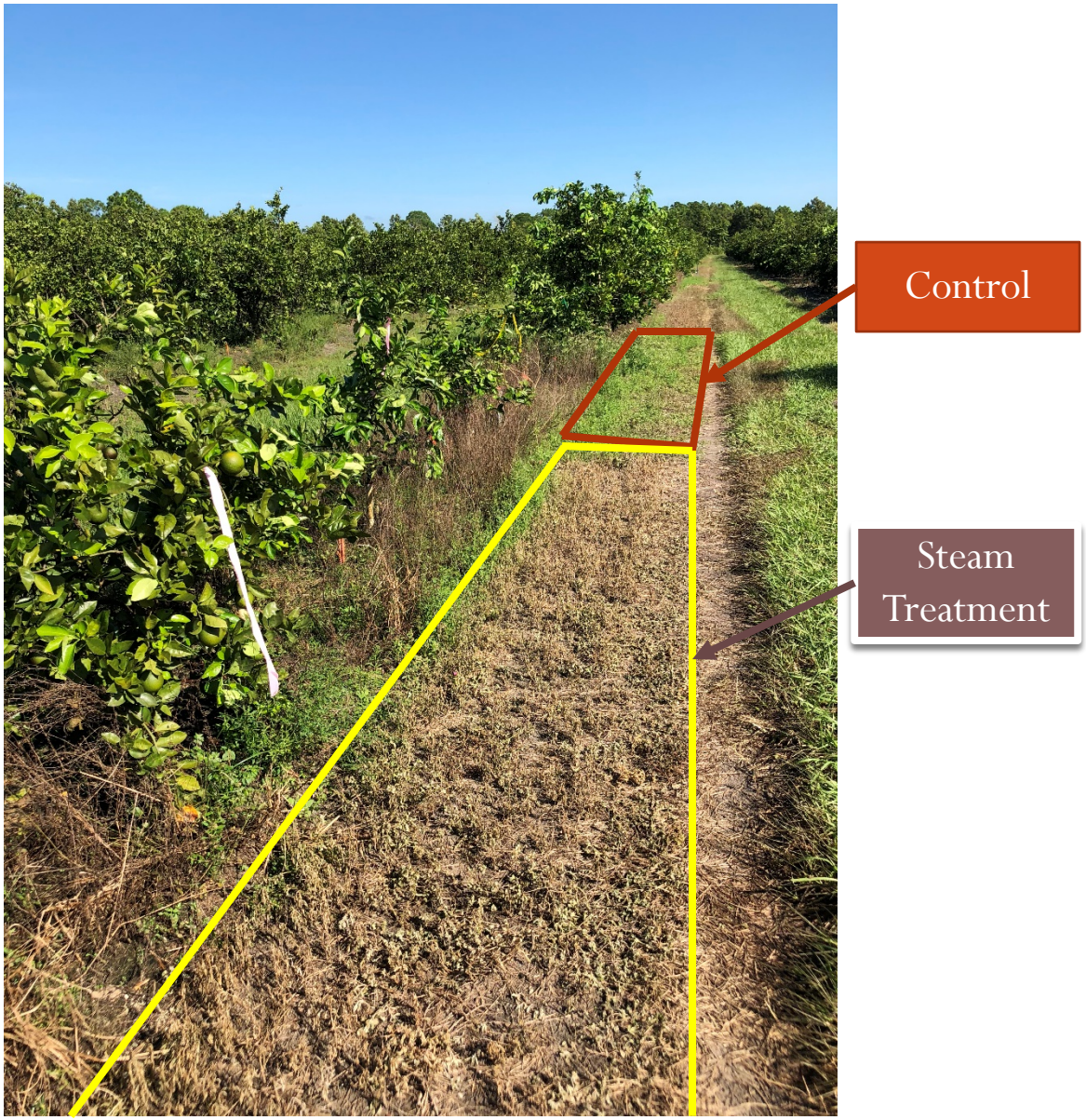
Temperature profile (inside the boom section) using ***high flow rate*** (HFL) and ***low (1.2 km/h)*** and ***high (1.7 km/h) speed***. 50 cm bars of thermocouples (4 sensors) placed horizontally on the ground.





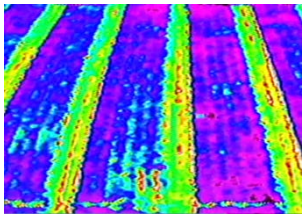


Steam Sprayer for Weed Management

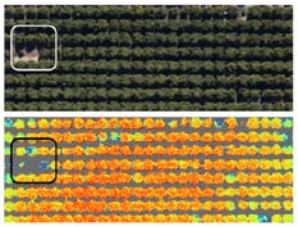


UAV Imaging

- Thermal
- Multi-Spectral
- Visual – RGB
- LiDAR













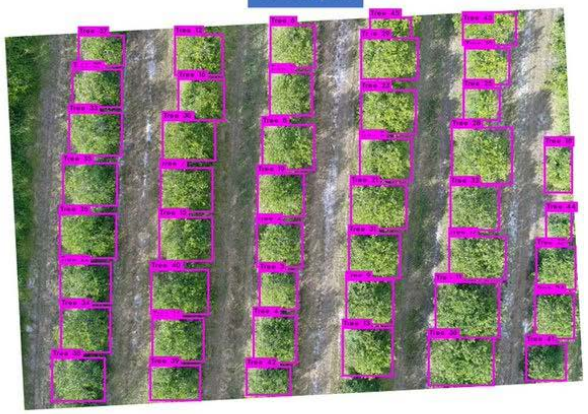


UAV-based Image Analysis Using Artificial Intelligence-AI: #TreeCount, #TeeGeoreference, & #TreeCategory

Source



AI Output



PrecAg Program UF SWFREC
https://twitter.com/PrecAgSWFREC
Email: i.ampatzidis@ufl.edu

UAV-based Image Analysis Using Artificial Intelligence-AI: #TreeCount, #TeeGeoreference, & #TreeCategory

Source

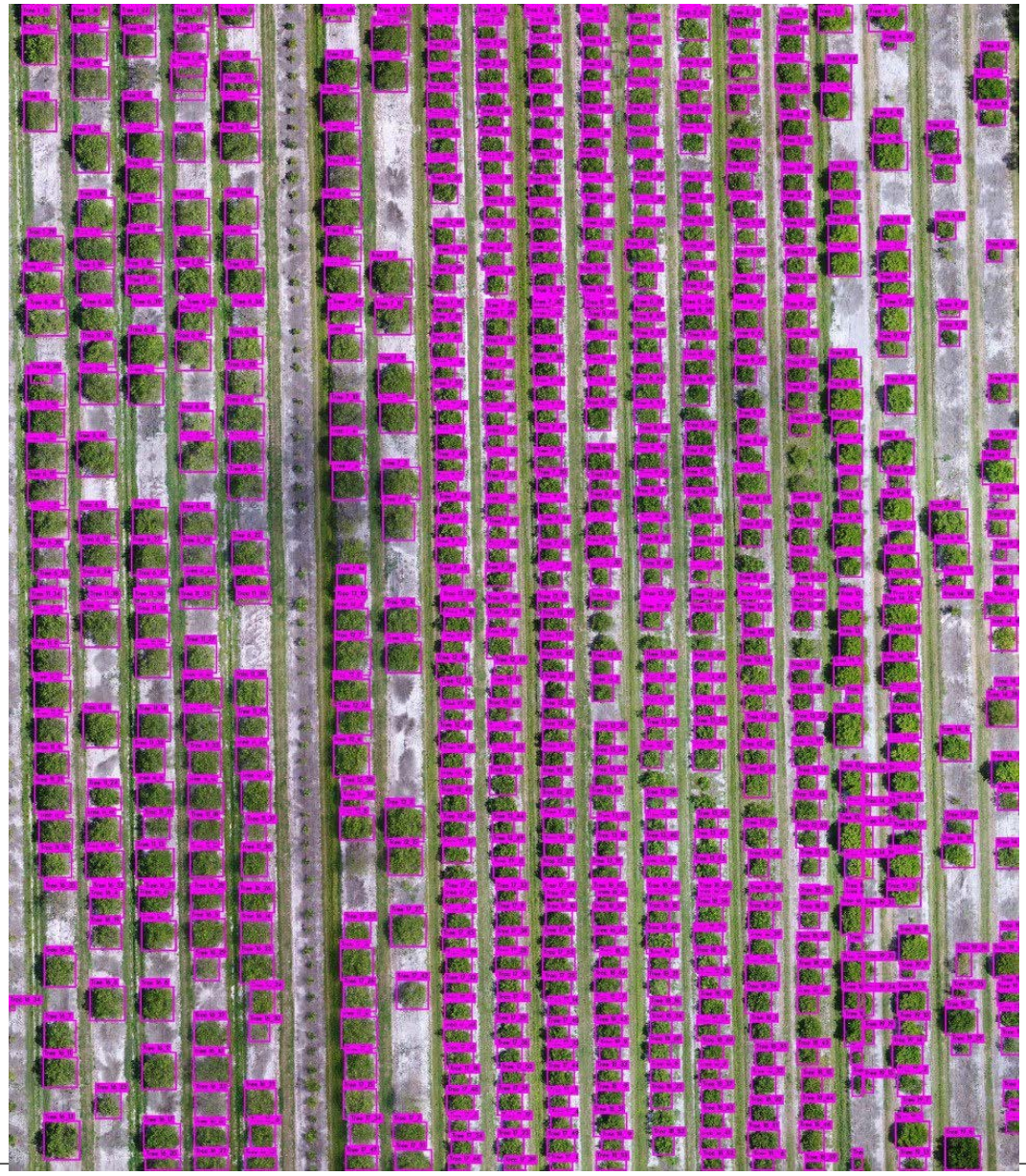
AI Output





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Email: i.ampatzidis@ufl.edu

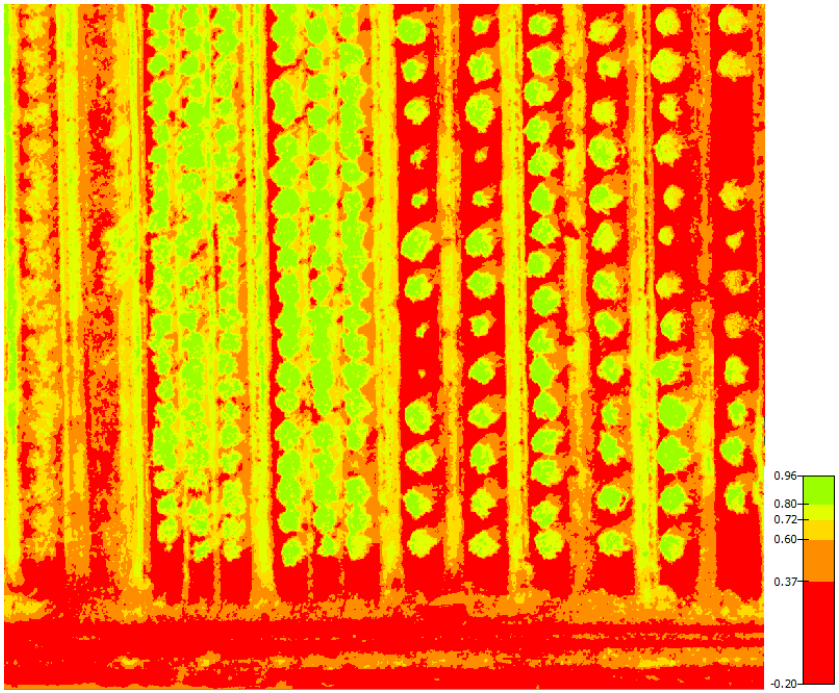
Citrus tree detection and counting (97% accuracy) using Artificial Intelligence (AI) and remote sensing

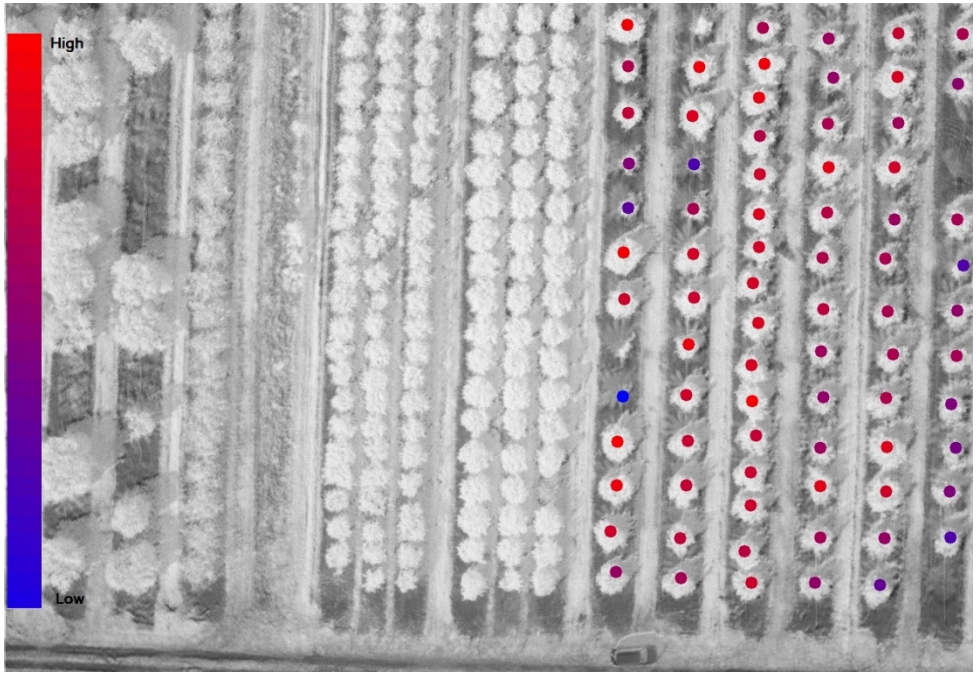


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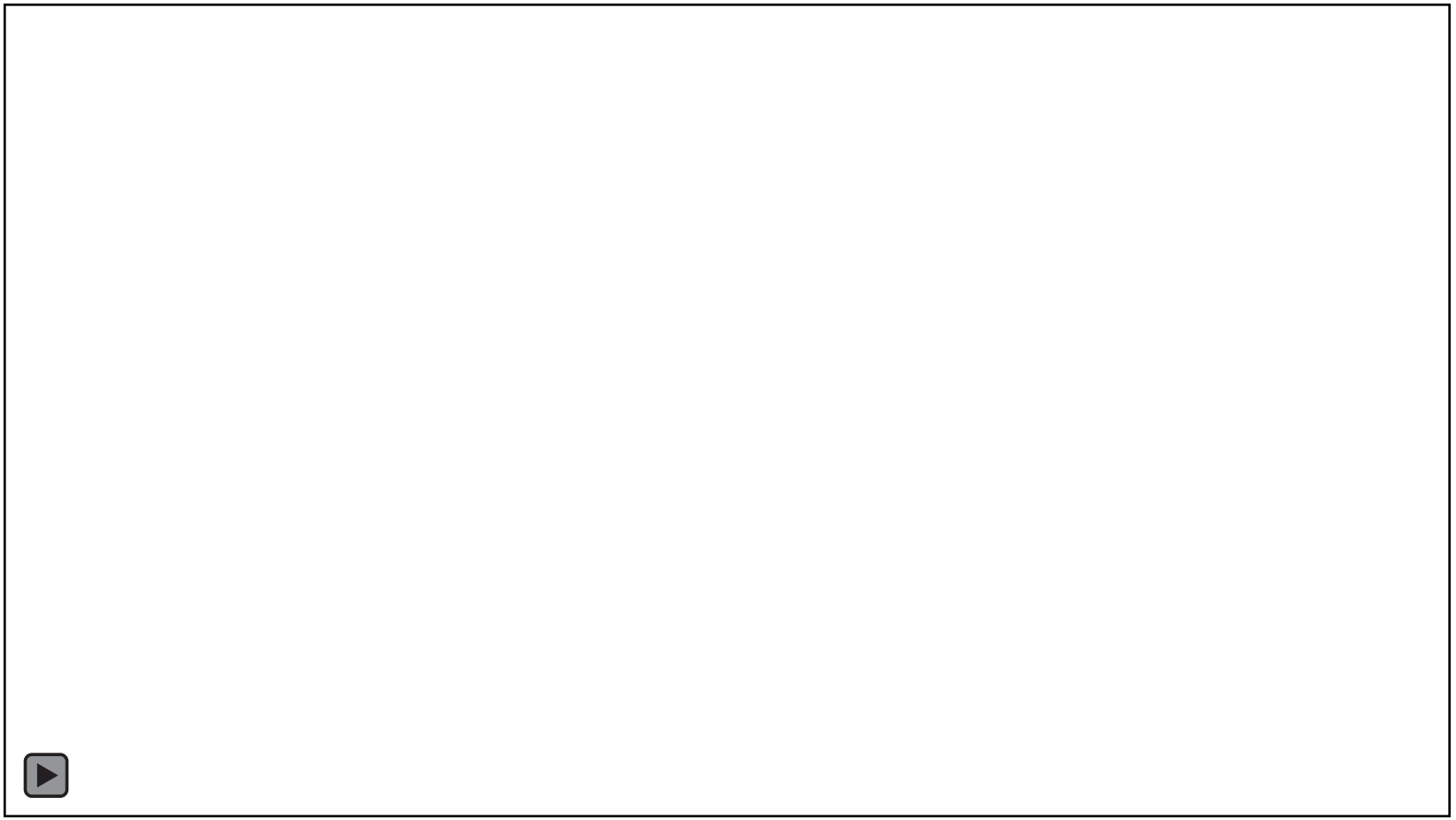


Citrus tree detection and counting (97% accuracy) using Artificial Intelligence (AI) and remote sensing



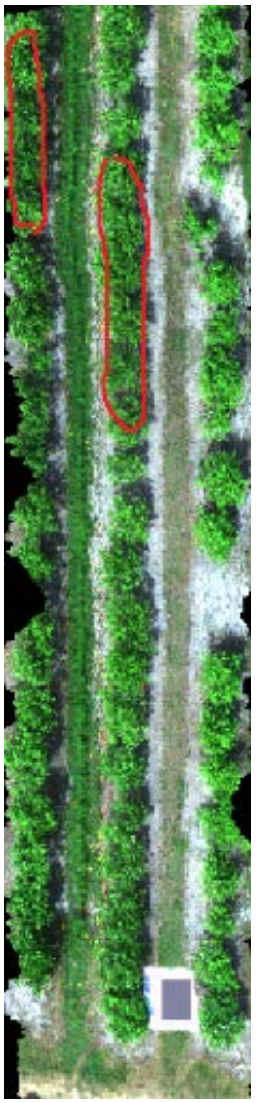


SWFREC Citrus Virtual Farm (3D model)



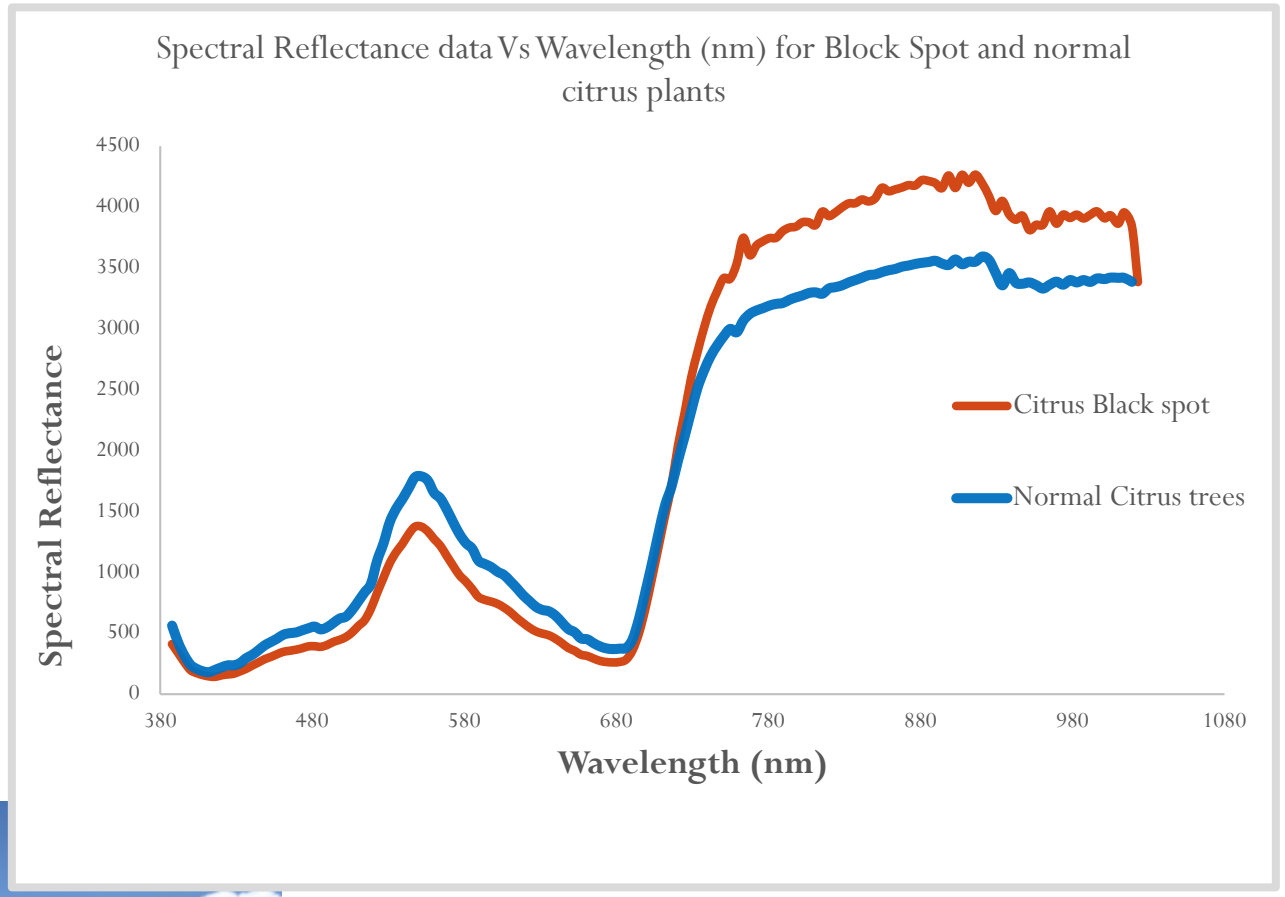
https://www.youtube.com/watch?v=LDyifjtLk7k

UAV-based CBS Detection



Red marks indicate potential CBS





UAV Sprayer for Disease Management





Questions/Comments?
Thanks for your attention!

UF IFAS
UNIVERSITY of FLORIDA

--

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Agricultural and Biological Engineering Department
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for updates about our program.